EXCESSIVE HEAT AND THE DEATH RATE IN KANSAS[1]

By S. D. FLORA

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A new record for deaths in Kansas, due to excessive heat, since statistics became available, was established last summer, according to the report of Dr. Earle G. Brown, Secretary of the State Board of Health. July 1934 was the hottest month of record in this State, which at times is subject to intense heat waves, and the climb of the death rate from heat was remarkable.

A total of 206 deaths was reported from this cause during the month as compared with 33 in July 1931, which had previously held the record. For the summer as a whole, 430 deaths from heat were reported, which is at the rate of 22.6 per 100,000 population. The previous record for any summer was 75 in 1931, but reliable mortality statistics in Kansas do not extend back to the hot summer of 1901. The total of accidental deaths from all causes in July also was the highest on record for any month, due, doubtless, to increase in outdoor recreation, such as motoring, swimming, and picnicking generally.

During the 12-day period, July 10 to 21, when all-time heat records were broken in most parts of the State, there were 113 fatal heat strokes, or 55 percent of the total for the entire month.

[1] *See also* "Maximum temperatures and increased death rates in the drought area in 1934" by S. D. Collins and M. Gover. Reprint from U. S. Public Health Reports, Vol. 49, No. 35, August 31, 1934, pp. 1015–1018.—*Editor.*

Sixty-five percent of the summer's heat deaths were of persons 65 years old, or older, and were about equally divided between the sexes. Of the heat strokes, 186 were classified as originating in the home. There were but 13 occupational deaths and seven of these originated in connection with agriculture.

During July there were 10 deaths of children under five years of age, 4 of persons 5 to 14 years old, 57 in age group 26 to 64 years, and none in the age group 15 to 24 years. Included in the 10 children under 5 years were 9 infants. Excluding these infants, the average age of the remaining 197 persons was 69.6 years.

Excessive heat as a cause of death was, apparently, far more effective in cities than in rural sections. There were 114 deaths in cities of more than 2,500 population, compared with 92 in smaller towns and rural sections. A majority of the deaths from excessive heat occurred in the eastern third of the State, where most of the larger cities are located and where the humidity is higher, the nights warmer, and the wind movement less, though maximum temperatures are not likely to be as high there as farther west. Only 19 of the heat deaths were reported from the western half of the State.

A USEFUL HYGROMETRIC CALCULATING DEVICE

By LESLIE G. GRAY

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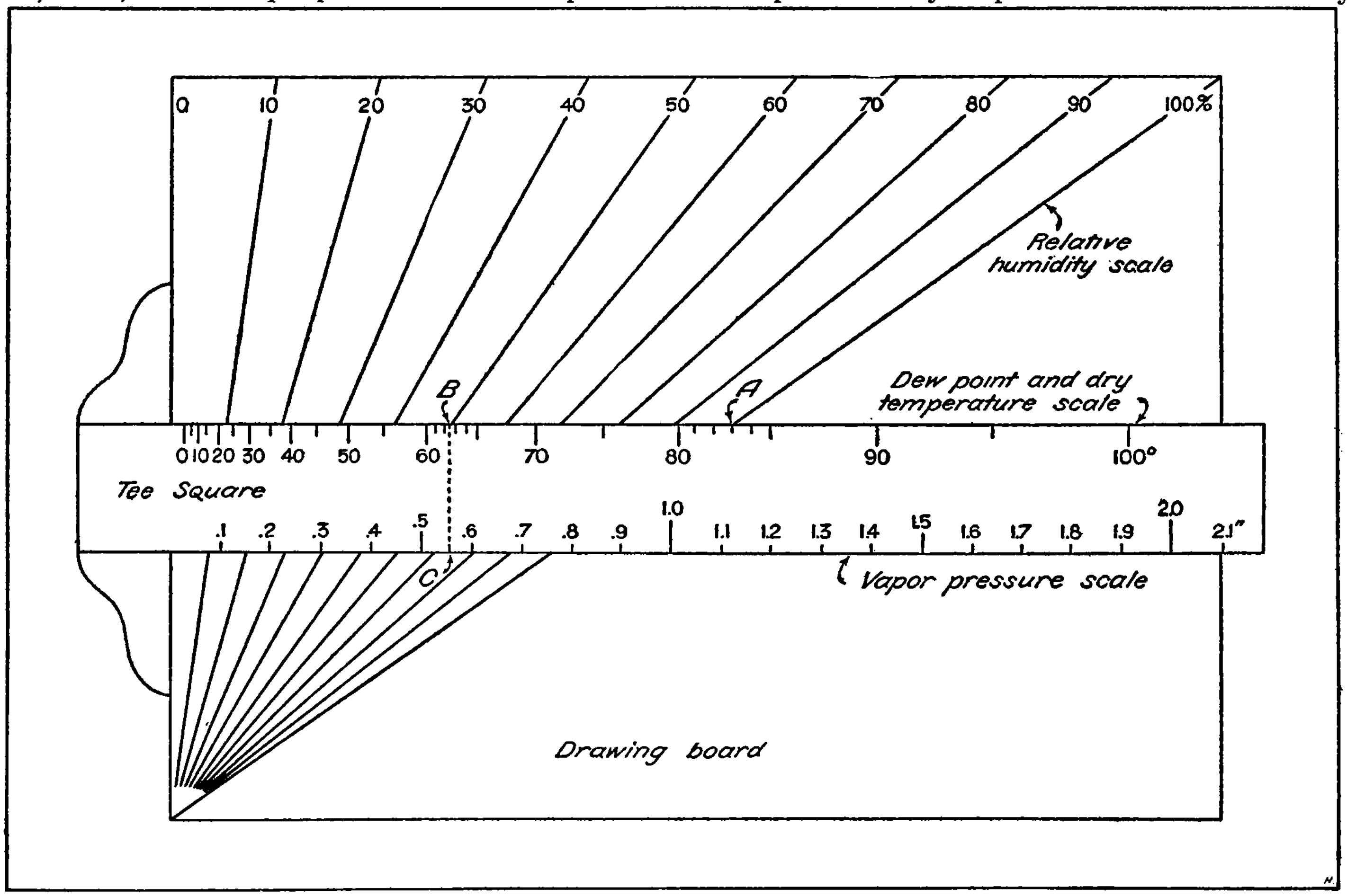
The figure shows schematically a graphical computing device, designed to expedite the calculation of various hygrometric factors; the necessity for consulting tables is eliminated, provided that one of the known factors is relative humidity, dew point or vapor pressure, thus taking care of the elevation (air pressure) factor. The device was used to permit rapid computation of more than 350,000 dew points in connection with fire weather data summarizations by O. W. A. and F. E. R. A. personnel, which otherwise would have been computed laboriously from tables. When tables are used, the work progresses very slowly, since the wet bulb depression must be found, tables appropriate to the station elevation must be used, several pages usually have to be turned to find the proper place, and care must be taken to follow down and across vertical and horizontal columns of figures, respectively, to find proper values. If wet bulb temperatures are not available, the wet bulb depression must be found from tables by a reverse process, and the proper table must then be consulted for the desired value, using the depression so found. The graphical device, however, permits rapid determination of dry temperature, given relative humidity and dew point or vapor pressure; of relative humidity, given dry temperature and dew point or vapor pressure; or of dew point or vapor pressure, given dry temperature and relative humidity; as well as several other combinations. The use of one previously computed value (as relative humidity or dew point) takes care of the elevation factor; and the degree of accuracy of the results depends on the size of the scales and the accuracy of their construction. Since straight lines are used throughout, no great drafting skill is required to construct this device.

The device consists of an ordinary drawing board and T-square, to each of which are fastened suitable scales. The drawing board scale represents relative humidity by lines drawn from a common center, and so spaced that along any horizontal line represented by the edge of the T-square blade, equal intervals of humidity are represented by equal distances. As thus prepared, the network of lines represents a system for dividing into equal parts a horizontal line of any length within its range. The horizontal line is provided by the edge of the T-square blade, on which a scale of vapor pressure by equal intervals is laid off. Opposite appropriate saturation vapor pressures on this scale, a scale of temperature is laid off, the temperatures thus corresponding to dew points at the same dry temperatures and 100 percent relative humidity. By definition, relative humidity is given by the actual vapor pressure (equivalent to a dew point) divided by the saturation vapor pressure at the given dry temperature (the dew point for 100 percent relative humidity). These considerations are independent of station elevation.

In use, the only special precaution to be observed with the device is to keep the head of the T-square firmly against the edge of the drawing board. Prior to use, the zero of the vapor pressure scale on the blade should be tested for coincidence throughout with the zero relative humidity line on the drawing board by sliding the square up and down. For example, as shown in the figure, suppose the dry temperature is 82.8° and the relative humidity 50 percent, required the dew point and vapor pressure. Slide the T-square up or down the board until the dry temperature on the edge of the blade coincides with the 100 percent relative humidity line, as at A. With this setting, representing to scale the saturation vapor pressure for a temperature of 82.8°, each humidity line cuts the blade vapor pressure and temperature scales at proportional points. In this case, 50 percent relative humidity cuts the dew point scale at 62.6,° at B, and the vapor pressure at this dew point is 0.567 inch, at C. If the dry temperature again is 82.8°, and the dew point 23°, without changing the setting, it is apparent that the relative humidity is 10 percent. In other words, as set in this example, the device shows every related hygrometric factor (except wet bulb temperature or wet bulb depression) for a dry temperature of 82.8°.

The device possibly may be useful at some airways stations in rapidly computing relative humidity from dry temperature and dew point, as given in hourly observations; and at fire weather stations, for calculating values of dew point from dry temperature and relative humidity, on form 1009–E. All necessary data for construction of the scales appears in the dew point and equivalent vapor pressure columns of W. B. Pub. No. 235, Psychrometric Tables by C. F. Marvin.



THE PRINCIPLES UNDERLYING THE CHOICE OF VISIBILITY MARKS[1]

By W. E. KNOWLES MIDDLETON

[Meteorological Service of Canada, Toronto, Ontario, December 1934]

The estimation of the distance of visibility, or "visual range", by eye is probably one of the least satisfactory of all meteorological observations. Quite apart from the excellence or otherwise of the observer's eyesight, it must be recognized that this element depends to a large extent upon the nature of the marks at which he can look.

What are the criteria of a satisfactory method of determining the visual range? Surely they cannot be very different from those which apply to any other observation; we shall suggest two:

(1) Observations made at different stations shall be intercomparable.

(2) Observations made by night shall be comparable with those made by day.

It will be the purpose of this note to suggest procedures by means of which these conditions may at least be approximated.

It has been shown (6) (7) (8) that the visual range of a black object against the horizon sky is given by the formula

$$S_s = \frac{1}{\sigma} \ln 50 = \frac{3.912}{\sigma} \tag{1}$$

where σ is the extinction coefficient[2] of the atmosphere in the horizontal. This formula is independent of azimuth, and holds if the sky is cloudless or completely clouded.

[1] Published by permission of the Director of the Meteorological Service of Canada.

[2] The extinction coefficient is defined by the equation

$$dE = -\sigma E dx,$$

where E is the flux-density in a parallel beam of light traveling in the direction of x. It is a convenient measure of the obscurity of the atmosphere at a given time and place.

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